

High Performance Photocatalytic Oxidation Reactor System, Phase I

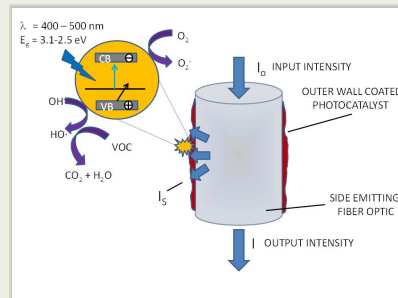
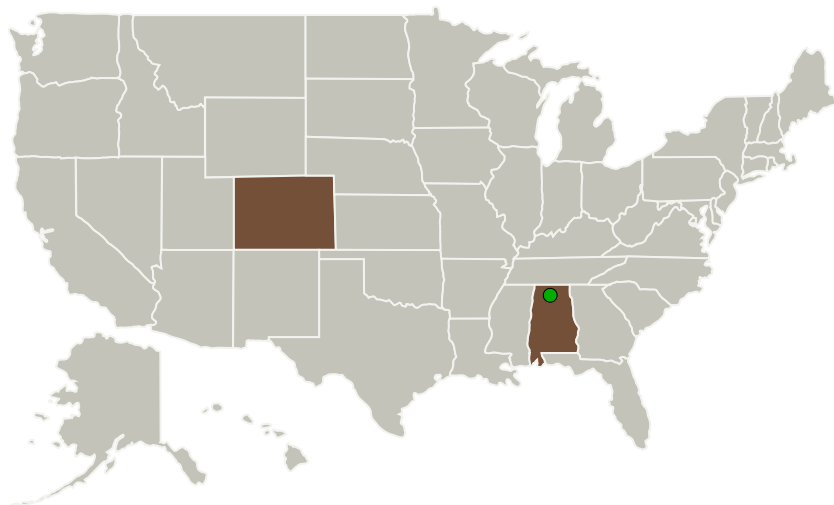
Completed Technology Project (2013 - 2013)



Project Introduction

Pioneer Astronautics proposes a technology program for the development of an innovative photocatalytic oxidation reactor for the removal and mineralization of Volatile Organic Compounds to extend crewed space exploration beyond low earth orbit. This novel technology, called the High Performance Photocatalytic Oxidation Reactor System (HPPORS) leverages recent progress in high power Light Emitting Diodes (LED) and efficient, visible wavelength photooxidation (PO) catalysts to completely oxidize Volatile Organic Compounds (VOCs) to carbon dioxide and water. The basis of the innovation is the synthesis of commercial high power, high brightness LEDs with efficient geometric illumination of active visible-light activated PO catalyst in a high surface area to volume fiber optic reactor. This combined approach leads to numerous performance benefits including high VOC conversion efficiency, compact reactor volume, and low pressure drop. The development of the HPPORS technology will lead to a photocatalytic reactor that meets the rigorous compliance requirements of complete VOC mineralization to CO₂ and H₂O, while utilizing efficient visible LEDs or solar energy in a compact, scalable package.

Primary U.S. Work Locations and Key Partners



High Performance Photocatalytic Oxidation Reactor System

Table of Contents

| | |
|--|---|
| Project Introduction | 1 |
| Primary U.S. Work Locations and Key Partners | 1 |
| Project Transitions | 2 |
| Images | 2 |
| Organizational Responsibility | 2 |
| Project Management | 2 |
| Technology Maturity (TRL) | 2 |
| Technology Areas | 3 |
| Target Destinations | 3 |

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| Organizations Performing Work | Role | Type | Location |
|--------------------------------------|-------------------------|---|---------------------|
| Pioneer Astronautics | Lead Organization | Industry Historically Underutilized Business Zones (HUBZones) | Lakewood, Colorado |
| ● Marshall Space Flight Center(MSFC) | Supporting Organization | NASA Center | Huntsville, Alabama |

Primary U.S. Work Locations

| | |
|---------|----------|
| Alabama | Colorado |
|---------|----------|

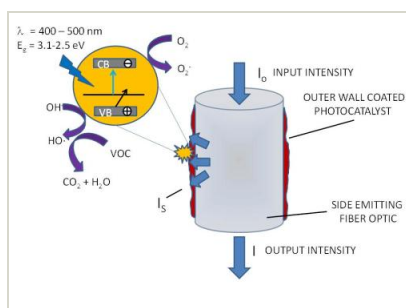
Project Transitions

**May 2013:** Project Start**November 2013:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/138213>)

Images



Project Image

High Performance Photocatalytic Oxidation Reactor System

(<https://techport.nasa.gov/image/135238>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Pioneer Astronautics

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

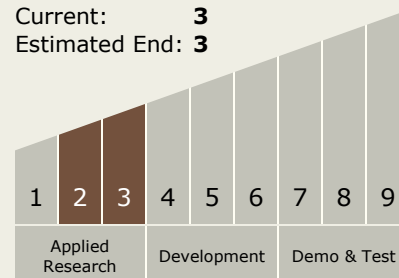
Thomas L Henshaw

Technology Maturity (TRL)

Start: 2

Current: 3

Estimated End: 3



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Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
 - └ TX06.1 Environmental Control & Life Support Systems (ECLSS) and Habitation Systems
 - └ TX06.1.1 Atmosphere Revitalization

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System